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# The Light Answer



## Deep-tissue laser therapy for low-back pain gets results **By Perry Nickelston, DC**

**M**ore than 80 percent of the US population will experience some form of back pain over the course of their lifetime. These people want pain relief and are desperate to improve their quality of life. A growing number of progressive health care providers are giving them relief by using Class IV high-power deep-tissue laser therapy. Unfortunately, there is a plethora of misinformation regarding laser therapy, such as which type is best, how much to use (dosage), treatment frequency and even proper diagnostic procedures.

First theorized by Albert Einstein in 1916, and invented by Theodore Maiman in 1960, the laser has become one of the most ben-

eficial inventions used in modern society. In 1967, Dr. Endre Mester, a professor of surgery in Hungary, performed a revolutionary series of experiments that first documented the healing effect of lasers. Therapy lasers have been used and researched in Europe for more than 30 years. The U.S. Food and Drug Administration (FDA) approved the first low-level Class III laser (LLLT) in 2002 and the first Class IV therapy laser in 2003. The most significant clinical and therapeutic difference between Class IV lasers and Class III is the Class IV can produce a primary biostimulative effect on deeper tissues while also producing substantial secondary and tertiary effects.<sup>1</sup>

Laser therapy aims to photobiostimulate chemically damaged cells. This therapy actually excites the kinetic energy within cells by transmitting healing energy known as photons. The skin absorbs these photons via

a photo-chemical effect, not photo-thermal; therefore, it does not cause heat damage to the tissues.

Once photons reach the cells of the body, they promote a cascade of cellular activities. It can ignite the production of enzymes, stimulate mitochondria, increase vasodilation and lymphatic drainage, synthesize ATP, and elevate collagen formation substances to prevent the formation of scar tissues. This is a critical step in reducing long-term disabling chronic myofascial pain syndromes and joint hypermobility. Other formative cells are also positively influenced. One of laser therapy's many immune-enhancing effects is an increase in the number of macrophages.<sup>2</sup> When determining how to apply laser therapy for back pain, there are a few key factors to consider.

### Laser Power

Power affects penetration, dosage and treatment time. More power offers deeper penetration, higher therapeutic dosages and

decreased treatment times. Lasers are classified by power. Class III "cold lasers" are at maximum power output of 500mw from a single-laser source. Class IV lasers are anything over 500mw.

You cannot make up for insufficient power by increasing treatment time. Depth of tissue penetration will not increase with more application time if you have insufficient power. Positive results require more than increasing time. Sixty-five percent of laser energy is absorbed in the skin and subcutaneous tissue layers with the following having a high affinity for absorption: hemoglobin in blood; melanin in skin, hair, moles, and others; and water (present in all biological tissue). In order to overcome these factors, start with large quantities of energy to reach the deeper target cells and myofascial structures with a required dose.

### Optimal Dosage

Dosage is the single most important parameter for a successful outcome in laser therapy. Too little or too much energy produces no effect. There is an "optimum window" of therapeutic dosage. The matter of correct dosage is very complicated, since a number of factors must be taken into account, including laser wavelength, power density, type of tissue, condition of tissue, acuteness or chronicity of the problem, skin pigmentation, treatment technique and depth of target tissue.

The primary factors in laser therapy that determine dosage are power and time. While power is the amount of energy measured at the source of the beam, dosage is the amount of energy delivered to the skin and target tissue. Dosage may also be referred to as energy density or fluence. Its unit of measure is the Joule (J). Current industry dosage application requires 1- 4 J/cm<sup>2</sup> for superficial, and 4-10J/cm<sup>2</sup> for deeper conditions.<sup>3</sup> Therefore, a 50cm<sup>2</sup> deep-tissue area may require up to 750J for maximum effect.

### Optimal Wavelength

Light characteristics are determined by its placement along the electromagnetic spectrum. Wavelength is calculated in nanometers (nm). The ideal range for therapeutic lasers is along the invisible red (IR) spectrum of 790-970 nm. IR beams penetrate deeper into the body for increased effects on cellular tissue. Wavelengths in the visible red (VR)



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## [LASER THERAPY]

600s nm spectrum are ideal for superficial conditions and limited in deep penetration.<sup>4</sup> Wavelengths above 1000nm lose therapeutic value and cross over into surgical laser applications. Deep-therapy applications such as spinal stenosis, disc herniations, hip derangements, trigger points of spinal intrinsic stabilizer muscles and neuropathic conditions are inherently more responsive to the IR wavelength.

### Proper Diagnostic Procedures

Simply treating the symptomatic area will not give you maximum results with laser. It is vitally important to treat the underlying kinetic chain referral and compensation patterns. High-power, deep-tissue laser allows you to treat many of these contributing areas with proper dosage during a single therapy session. The key is to address dysfunctional painful (DP) patterns in combination with the dysfunctional non-painful (DN).

By utilizing special evaluation procedures from the SFMA™ (Selective Functional Movement Assessment), created by Gray Cook, MSPT, OCS, CSCS, and Kyle Kiesel, PT, PhD, ATC, CSCS, you can implement an integrated model to address regional interdependence to locate the dysfunctional non-painful areas.<sup>5</sup> What you will typically find with chronic back pain sufferers is involvement with ankle, hip and thoracic spine hypomobility combined with knee, pelvic and lumbar instability.

### One Case Study

This is an actual case study that presented to my office by patient referral for Class IV deep-tissue laser therapy. The patient entered with a complaint of chronic centralized lower-back pain with periodic radiation into the right gluteus region and outer thigh. There was an insidious onset of symptoms, with no known mechanism of injury. The patient is currently taking prescription pain medication and anti-inflammatories. Pain is a 6/7 on a scale of 10. MRI confirmed a right postero-lateral disc herniation at L4/5.

Prior courses of treatments included physical therapy (i.e., electric muscle stimulation, ultrasound, exercise), chiropractic manipulation and one epidural injection. All therapies provided only temporary relief of symptoms.

The term functional describes any unlimited or unrestricted movement. Dysfunctional describes movements that are limited

or restricted in some way demonstrating a lack of mobility, or symmetry within a given movement pattern. Painful denotes a situation where the selective functional movement reproduces symptoms, increases symptoms, or brings about secondary symptoms that need to be noted.<sup>6</sup>

Selective Functional Movement Assessment (SFMA™) revealed the following:

- Multi-Segmental Flexion—Dysfunctional Painful (DP);
- Multi-Segmental Extension—Functional and Painful (FP);
- Multi-Segmental Rotation—Dysfunctional and Non-Painful (DN) with a breakout pattern of right standing rotation lateral single leg;
- Single Leg Stance (Right)—Functional and Painful (FP); (Left)—Dysfunctional and Non-Painful (DN);
- Squatting Pattern—Dysfunctional and Painful (DP);
- Upper Extremity Movement Patterns (Right)—Functional and Painful (FP); (Left)—Dysfunctional and Non-Painful (DN);
- Cervical Movement Patterns—Functional and Non-Painful (FN).

We already know the key to the SFMA and deep-tissue laser therapy application is to treat the dysfunctional non-painful in conjunction with the symptomatic complaint. Based on the above (DN) results, I performed a more in-depth evaluation of bilateral hips, ankles and thoraco-lumbar junction for mobility issues and inter-related myofascial trigger points.

### Application

Laser therapy application consisted of the following protocols. Class IV deep-tissue laser treatment at 10 watts of power on continuous wave (CW) output with 600J of energy delivered per minute.

Fiber was held one quarter inch from skin and applied with a sweeping motion at half the speed of ultrasound. Based on Joules per cm<sup>2</sup> for deep-tissue application, I applied the following dosages to these regions per single session.

- Lumbar spine T12-L5 (including bilateral quadratus lumborum) 4000J;
- Bilateral hip and gluteus 2000J per hip;
- Bilateral plantar fascia 1000J per foot;
- Bilateral iliopsoas/iliacus 2000J per side;
- Total Joules of laser energy for session: 14,000J.

Treatment guidelines and laser dosage was administered over a large square area and multiple regions, thus preventing overstimulation and cellular inhibition.<sup>7</sup>

The patient was put on a care plan of three visits the first week and two visits per week for a total of 10 sessions. The patient returned after one session with an approximately 50-percent reduction in symptoms. After the full 10 sessions, the patient was pain free, was prescribed corrective exercises for restoring faulty movement patterns, and was instructed in active isolated stretching combined with self-myofascial release techniques using foam rollers, tennis balls and a stick.

Lasers are a hot buzzword now. For the next few years, laser therapy will appear high-tech to patients. They will be seeking this treatment option and you can enhance this process by branding your practice as cutting edge and state-of-the-art. Lasers help move your practice to a higher quality, volume and fee structure.

When incorporating laser therapy into your office, research a quality product manufacturer that offers extensive training in Class IV application. Class IV laser therapy can be the answer your patients have been searching for in regaining their quality of life. ■

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